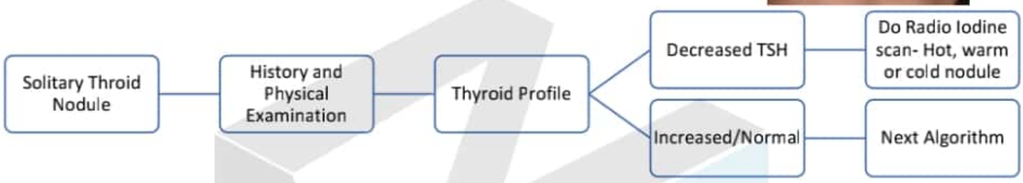
Head & Neck Surgery

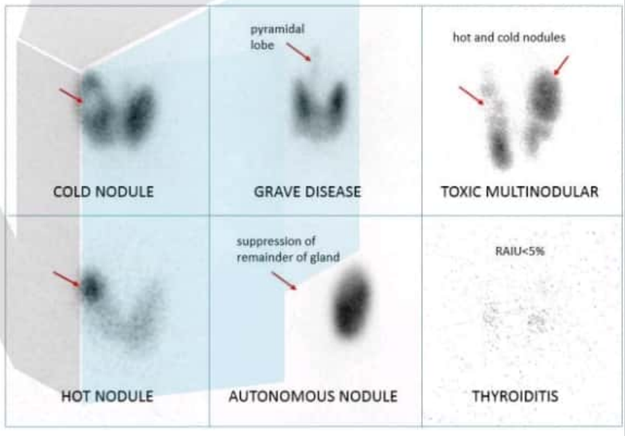
Solitary Thyroid Nodule

Case: A 57-year-old female presents with a new diagnosis of a thyroid nodule. Routine workup includes all of the following except:

a) Physical examination
b) TSH
c) Cervical USG
d) **Thyroglobulin**



- Cold nodules have to evaluated further for risk of malignancy
- Hot nodules are usually benign

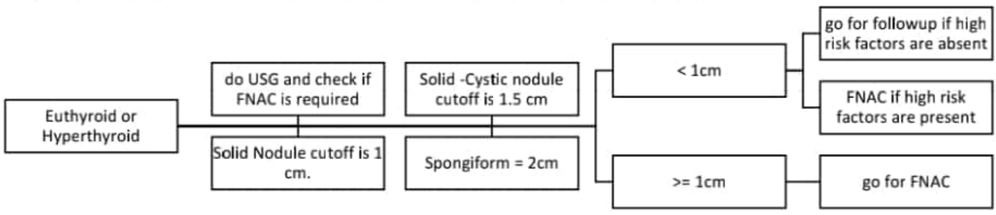


Mx: Hot Nodules: Anti-thyroid drugs for at least 6 months

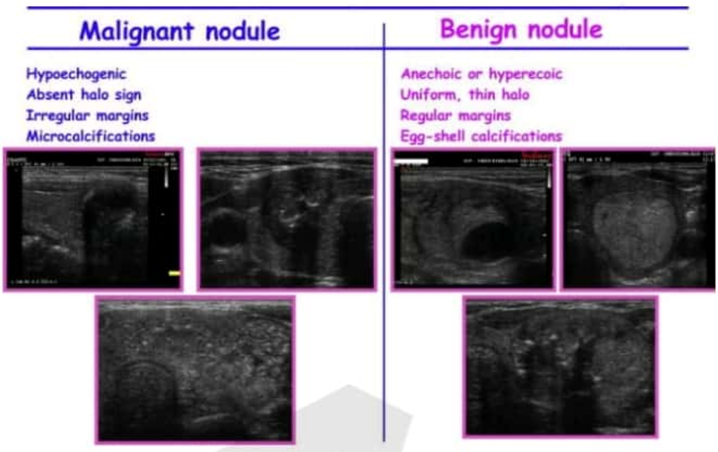
Warm/Cold nodules: Manage as a Euthyroid/Hyperthyroid Nodule

If USG shows completely cystic nodule, then there is no FNAC required and just go for followup.

High Risk Factors: LN involvement, Family history, H/O Prev irradiation


Euthyroid or Hyperthyroid
do USG and check if FNAC is required
Solid Nodule cutoff is 1 cm.
Solid -Cystic nodule cutoff is 1.5 cm
Spongiform = 2cm
< 1cm
>= 1cm
go for followup if high risk factors are absent
FNAC if high risk factors are present
go for FNAC

ACR TI-RADS
COMPOSITION (Choose 1)
Cystic or almost completely cystic 0 points
Spongiform 0 points
Mixed cystic and solid 1 point
Solid or almost completely solid 2 points
ECHOGENICITY (Choose 1)
Anechoic 0 points
Hyperechoic or isoechoic 1 point
Hypoechoic 2 points
Very hypoechoic 3 points
SHAPE (Choose 1)
Wider-than-tall 0 points
Taller-than-wide 3 points
MARGIN (Choose 1)
Smooth 0 points
Ill-defined 0 points
Lobulated or irregular 2 points
Extra-thyroidal extension 3 points
ECHOGENIC FOCI (Choose All That Apply)
None or large comet-tail artifacts 0 points
Macrocalcifications 1 point
Peripheral (rim) calcifications 2 points
Punctate echogenic foci 3 points
Add Points From All Categories to Determine TI-RADS Level
0 Points
TR1 Benign No FNA
2 Points
TR2 Not Suspicious No FNA
3 Points
TR3 Mildly Suspicious FNA if ≥ 2.5 cm Follow if ≥ 1.5 cm
4 to 6 Points
TR4 Moderately Suspicious FNA if ≥ 1.5 cm Follow if ≥ 1 cm
7 Points or More
TR5 Highly Suspicious FNA if ≥ 1 cm Follow if ≥ 0.5 cm*
COMPOSITION
Spongiform: Composed predominantly (>50%) of small cystic spaces. Do not add further points for other categories.
Mixed cystic and solid: Assign points for predominant solid component.
Assign 2 points if composition cannot be determined because of calcification.
ECHOGENICITY
Anechoic: Applies to cystic or almost completely cystic nodules.
Hyperechoic/isoechoic/hypoechoic: Compared to adjacent parenchyma.
Very hypoechoic: More hypoechoic than strap muscles.
Assign 1 point if echogenicity cannot be determined.
SHAPE
Taller-than-wide: Should be assessed on a transverse image with measurements parallel to sound beam for height and perpendicular to sound beam for width.
This can usually be assessed by visual inspection.
MARGIN
Lobulated: Protrusions into adjacent tissue.
Irregular: Jagged, spiculated, or sharp angles.
Extrathyroidal extension: Obvious invasion = malignancy.
Assign 0 points if margin cannot be determined.
ECHOGENIC FOCI
Large comet-tail artifacts: V-shaped, >1 mm, in cystic components.
Macrocalcifications: Cause acoustic shadowing.
Peripheral: Complete or incomplete along margin.
Punctate echogenic foci: May have small comet-tail artifacts.
*Refer to discussion of papillary microcarcinomas for 5-9 mm TR5 nodules.



IOC for Solitary nodule: FNAC- Bethesda Classification/ Royal College of Pathology classification

2017 Bethesda System for Reporting Thyroid Cytopathology

Diagnostic Category	ROM if NIFTP not cancer	ROM if NIFTP is cancer	Management	Royal College of Pathology Classification
Nondiagnostic/unsatisfactory Cyst fluid only Acellular specimen Other: Obscuring factors	5–10%	5–10%	Repeat fine needle aspiration under ultrasound guidance	Thy 1
Benign Benign follicular nodule Chronic lymphocytic (Hashimoto) thyroiditis, in proper clinical setting Granulomatous (subacute) thyroiditis	0–3%	0–3%	Clinical and US follow-up until two negative	Thy 2
Atypia of undetermined significance/ follicular lesion of undetermined significance	6–18%	10–30%	Repeat FNA, molecular testing, or lobectomy	Thy 3 a
Follicular neoplasm/ suspicious for a follicular neoplasm (Specify if Hürthle cell type)	10–40%	25–40%	Molecular testing, lobectomy	Thy 3 F
Suspicious for malignancy	45–60%	50–75%	Lobectomy or near-total thyroidectomy	Thy 4
Malignant Papillary thyroid carcinoma Medullary thyroid carcinoma Poorly differentiated carcinoma Undifferentiated (anaplastic) carcinoma Squamous cell carcinoma Carcinoma with mixed features Metastatic malignancy Non-Hodgkin lymphoma Other	94–96%	97–99%	Lobectomy or near-total thyroidectomy	Thy 5

Molecular markers:

- BRAF(Papillary) / RAS(Follicular) / RET(Medullary) / p53 (Anaplastic)
- IHC Markers: Galectin-3 / HBME 1 / Cytokeratin / VEGF

Mx for Follicular Neoplasm as per Bethesda: Hemithyroidectomy and HPE of specimen to check of Capsular/Vascular invasion. If +nt → Malignant. If absent → Adenoma.

Thyroid Malignancy Surgeries

- Follicular / Papillary TC – Hemithyroidectomy (if < 4cm) or Total Thyroidectomy
- Medullary TC- Total Thyroidectomy with Level 6 LN Dissection.

Parathyroid Gland

Case: A 54 year old woman has proximal muscle weakness, polyuria and a depressed mood. She has a b/l flank pain and a h/o recurrent renal calculus. Lab workup reveals a S. Calcium evel of 11.2 mg/dl. Which of the following is the most probable diagnosis?

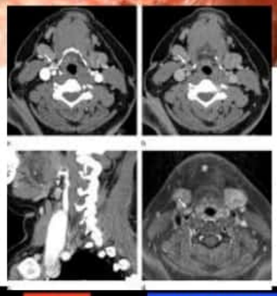
a) Hyperparathyroidism
b) Multiple Myeloma
c) Paget's disease
d) Sarcoidosis

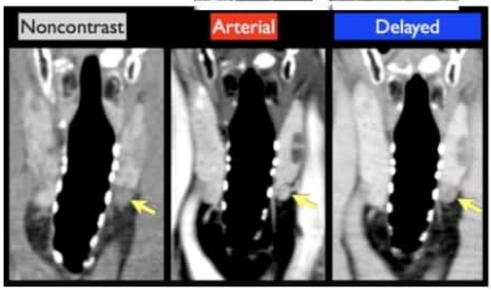
C/F:

- Bones
- Stones
- Abdominal Groans
- Psychiatric Moans
- Fatigue Overtones

Localisation studies:

- Tc Sestamibi SPECT (IOC)
- USG Neck
- 4D-CT
- MRI
- PET





4D- CT: 4D-CT includes image sets in three planes (axial, coronal, sagittal) from the angle of mandible to the mediastinum. The "fourth" dimension of 4D-CT is the perfusion information derived from multiple contrast phases. It is most commonly performed with three phases: non-contrast, arterial, and delayed phase imaging.

Bone changes of Hyperparathyroidism (irreversible)

Subperiosteal resorption of bone on the radial side in the middle phalange

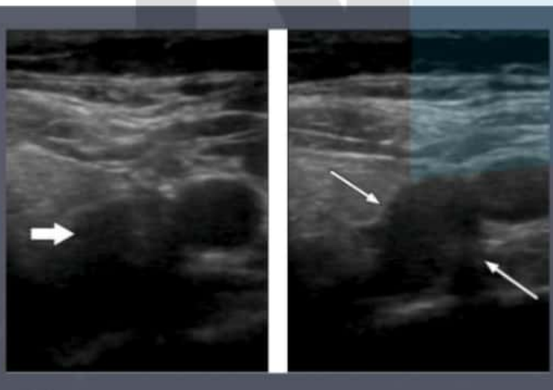
Jaw tumour Syndrome seen in hyperparathyroidism

(seen on OPG) aka Brown Tumour

Resorption of bone from the skull leading to formation of small holes

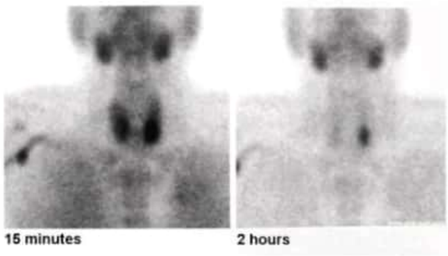
"Salt and Pepper" appearance

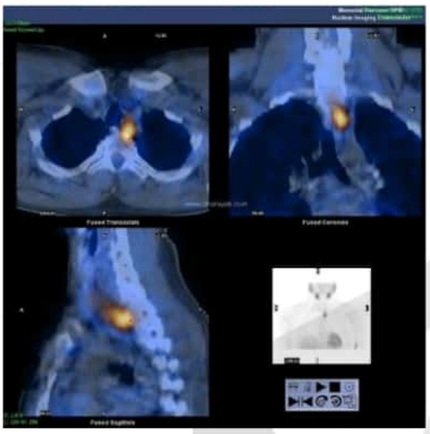
"Pepper Pot" Skull



55-year-old woman with primary hyperparathyroidism due to large left superior adenoma.
A, Sonogram shows hypoechoic nodule suspected of being parathyroid medial to common carotid artery (*arrow*).
B, Graded compression sonogram increases conspicuity of adenoma (*arrows*).

Sestamibi Scan for Parathyroid Adenoma





Tc 99 Sestamibi + SPECT

Indications for parathyroid surgery

1. Symptomatic patient
2. Asymptomatic and has:
    a. Age < 50 years
    b. Decrease in Bone Mineral Density
    c. Decrease in GFR (< 60 mL/min)
    d. S. Ca > 12mg/dL

Surgeries:

- Adenomas- Minimally Invasive parathyroidectomy
- Hyperplastic- B/L Neck exploration → 3 ½ gland removal or all 4 removal with ½ gland autotransplantation in brachioradialis of the non dominant forearm.
- Carcinoma- enblock excision

Intraoperative confirmation

- Intraop USG
- Intraop PTH- sample taken after 10 mins of removal. If fall in PTH >50% confirms parathyroid removal.
- Frozen Section
- Tc-99 Sestamibi Scan

Secondary hyperparathyroidism

- Mx by Calcium supplementation
- Indications for surgery:
  - Refractory to medical Mx.
  - (Calcium level) X (Phosphate level) is > 70
  - Gland >1cm
  - S. PTH >800 pg/mL
  - Calciphylaxis
  - Intractable pruritis
  - Refractory anemia
  - Ectopic calcification

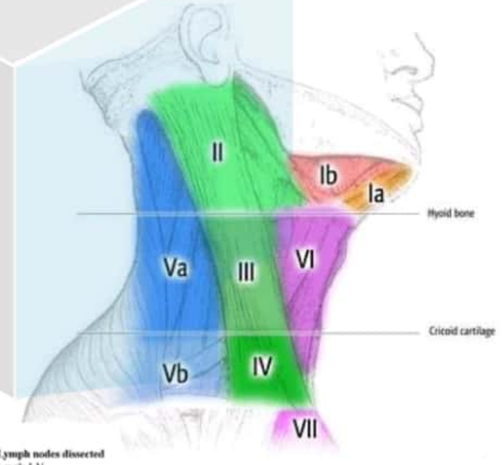
Tertiary hyperparathyroidism

Mx : B/L Neck Exploration (BNE)

Cervical Lymph Nodes

Levels of Neck Nodes

- There are 7 levels of neck and most have sublevels containing specific group of nodes
- Level I – Submental & Submandibular
- Level II – Upper Jugular
- Level III – Middle Jugular
- Level VI – Lower Jugular
- Level V – Posterior Triangle
- Level VI – Anterior/Central Compartment
- Level VII – Superior Mediastinal



Lymph nodes dissected
Levels I-V

Other structures excised
Sternocleidomastoid muscle
Internal jugular vein
Spinal accessory nerve
Submandibular gland

Classical radical neck dissection

Lymph nodes dissected
Levels I-V

Other structures excised
Sternocleidomastoid muscle
Internal jugular vein
Submandibular gland

Structures preserved
Spinal accessory nerve

Modified radical neck dissection Type I

Lymph nodes dissected
Levels I-V

Other structures excised
Internal jugular vein
Submandibular gland

Structures preserved
Sternocleidomastoid muscle
Spinal accessory nerve

Modified radical neck dissection Type II

Lymph nodes dissected
Levels I-V

Other structures excised
Submandibular gland

Structures preserved
Sternocleidomastoid muscle
Internal jugular vein
Spinal accessory nerve

Modified radical neck dissection Type III

LEVEL II

- Contain **Upper Jugular LN's**
- 2 groups – Sublevel IIa & IIb
- LN's are located around upper third of internal jugular vein & adjacent spinal accessory nerve
- Extent
  - Superiorly - Skull base
  - Inferiorly - Inf border of Hyoid bone
  - Ant (medial) boundary – stylohyoid mus
  - Post (lateral) boundary – posterior border of SCM

Extended ND= Radical ND+ any other struct.
Functional ND = MRDN 3

Comprehensive neck dissection	Radical Neck Dissection
	Extended Radical Neck Dissection
	Modified Radical Neck Dissection type I
	Modified Radical Neck Dissection type II
	Modified Radical Neck Dissection type III
Selective neck dissection	Supraomohyoid neck dissection
	Jugular (antero-lateral) neck dissection
	Central compartment (anterior) neck dissection
	Posterolateral neck dissection

Elective Neck Dissection = Selective Neck Dissection → prophylactic neck dissections (when LNs are not involved)

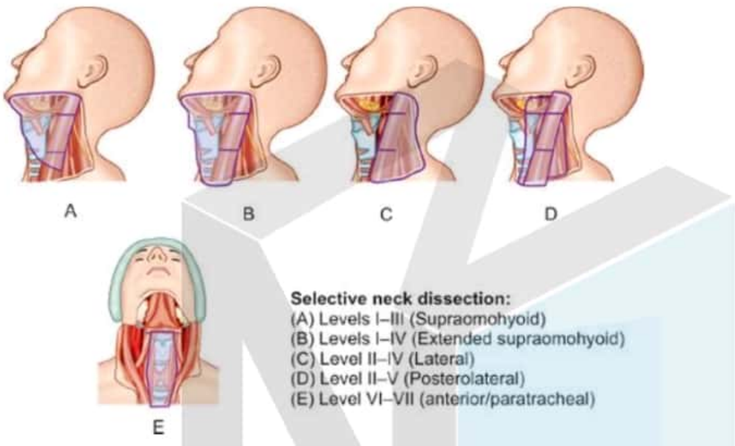


Table I. Classic US criteria used in differentiating benign vs. malignant lymph nodes.

Criterion	Benign	Malignant
B scan criteria		
Size	small	large
shape	oval	rounded
hilum	present	absent
echogenicity	moderate or low	marked hypoechoic
margins	sharp	irregular, blurred, angular, invasive
Structural changes – focal cortical nodules – intranodal necrosis – reticulation – calcification – matting	absent	present
Soft tissue edema	may be present	absent
Doppler criteria		
Flow	absent	present
Vessel location	central	peripheral
Vascular pedicles	single	multiple
Vascular pattern	regular	chaotic
Impedance values	low	high

Oral Cancers

Tongue cancers commonly arise from the lateral border

Lip cancer commonly arises from the vermillion border

Cheek cancer occurs at the angle of the mouth

TABLE 48.1 The TNM staging system.

Primary tumour (T)			
TX	Primary tumour cannot be assessed		
T0	No evidence of primary tumour		
Tis	Carcinoma in situ		
T1	Tumour <2 cm in greatest dimension		
T2	Tumour >2 but <4 cm		
T3	Tumour >4 cm but <6 cm		
T4	Tumour invades adjacent structures (e.g. mandible, skin)		
Regional lymph nodes (N)			
NX	Regional lymph nodes cannot be assessed		
N0	No regional lymph node metastasis		
N1	Metastasis in a single ipsilateral lymph node <3 cm in greatest dimension		
N2a	Metastasis in a single ipsilateral lymph node >3 cm but not more than 6 cm		
N2b	Metastasis in multiple ipsilateral lymph nodes, none >6 cm in greatest dimension		
N2c	Metastasis in bilateral or contralateral lymph nodes, none greater than 6 cm in greatest dimension		
N3	Metastasis in any lymph node >6 cm		
Distant metastasis			
M0	No evidence of distant metastasis		
M1	Evidence of distant metastasis		
Stage			
0	Tis	N0	M0
I	T1	N0	M0
II	T2	N0	M0
III	T3	N0	M0
	T1, T2, T3	N1	M0
IV	T4	N0	M0
Any T	N2	M0	
Any T	N3	M0	
Any T	Any N	M1	

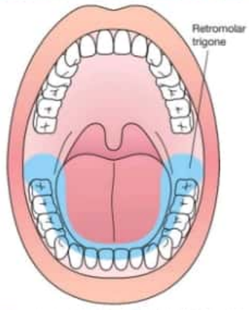
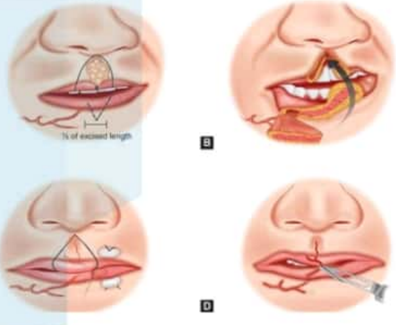


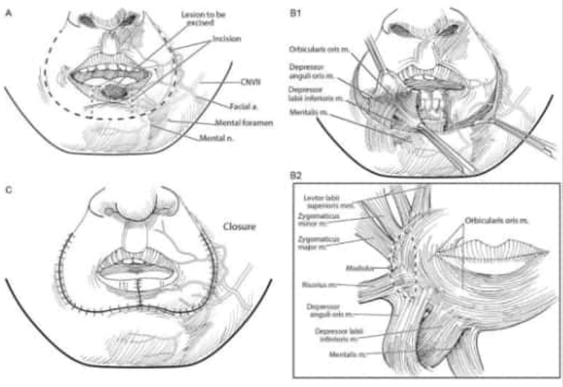
Figure 48.1 Common anatomical sites (blue) for oral squamous cell carcinoma.

Change	7th Ed. (2010)	8th Ed. (2017)		
		Oral Cavity	HPV- Oropharynx	HPV+ Oropharynx
T-stage	**T0**: no primary **T1**: size ≤2cm **T2**: size 2-4cm **T3**: size >4cm **T4**: o **T4a**: moderately advanced (extrinsic tongue muscle involvement constituted T4a) o **T4b**: very advanced	• **T0** deleted • **T1**: size ≤2cm and **DOI ≤5mm** • **T2**: size ≤2cm and **DOI 5-10mm** or size 2-4cm and **DOI ≤10mm** • **T3**: size >4cm or **>10mm DOI** • **T4a** extrinsic tongue muscle infiltration now deleted	• **T0** deleted	• **T0** if proven p16+ disease without evidence of primary tumor • All locally advanced combined to **T4**
		Clinical N-stage		
	N0: no LN involved **N1**: single ipsi LN ≤3cm in size **N2**: o **N2a**: single ipsi LN, 3-6cm in size o **N2b**: multiple ipsi LNs, all ≤6cm in size o **N2c**: any bi or ctr LNs, all ≤6cm in size **N3**: any LN >6cm in size	• **N1-N2** is same as previous and **ENE(-)** • **N3** now with subcategories: o **N3a** is previous N3 (size >6cm) and **ENE(-)** o **N3b** is any **ENE(+)**, either clinical or radiographic		• Previous N1, N2a combined to **N1 (≤6cm with or without ENE)** • Previous N2b, N2c combined to **N2**
		Pathological N-stage		
		• Microscopically evident ENE(+) LNs results in upstaging		• **N1**: ≤4 LNs involved • **N2**: >4 LNs involved • **N3** deleted
Stage grouping	Clinical or pathological TNM used for same grouping system	Same as previous		**Separate clinical and pathological TNM groupings**

- Mx: Stage 1 or 2 – Sx or RT
  Stage 3 or 4 – Sx + RT ± Chemo
- Appropriate surgical margin – 3.5 cm
- Abbey Estlander's Flap: Based on labial artery (image →)



- Other modalities
  - Jhonsons Step reconstruction
  - Karapandzic flap (Image →)
  - Webstar-bernard flap



- Radial forearm flap is used to reconstruct tongue after Hemi glossectomy
- Rectus Abdominis Flap is used after Total Glossectomy
- PMMC – Pectoralis Major myocutaneous Flap is used for reconstruction after cheek cancer

- Radiotherapy: Brachytherapy or EBRT with Iridium 125 or 192

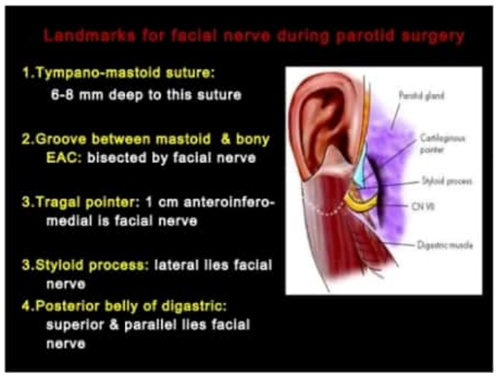
- Lip Cancer:
  - LN Involved- Conventional Neck dissection
  - **Not involved- Follow up**
- Cheek/Buccal Mucosa & Tongue Cancer:
  - LN +ve : Conventional ND
  - **LN -ve : Elective ND**

Salivary Gland

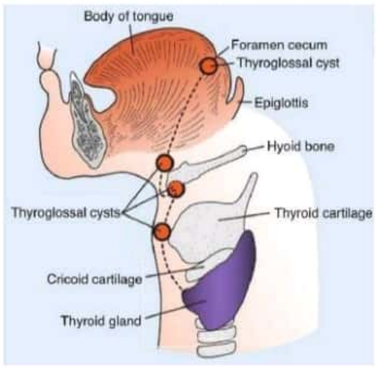
Ranula – extravasation cyst of sublingual gland (Not retention cyst)

Rx: Excision or Marsupialization (Oral Approach)

Plunging Ranula- Dumbell shaped swelling in the neck, when ranula size crosses the mylohyoid muscle. It is a MUCUS retention cyst of sublingual gland.
Rx: Intraoral excision (Update)


Landmarks for facial nerve during parotid surgery
1.Tympano-mastoid suture:
6-8 mm deep to this suture
2.Groove between mastoid & bony EAC: bisected by facial nerve
3.Tragal pointer: 1 cm anteroinfero-medial is facial nerve
3.Styloid process: lateral lies facial nerve
4.Posterior belly of digastric: superior & parallel lies facial nerve
Parotid gland
Cartilaginous pointer
Styloid process
CN VII
Digastric muscle

Tragal Point is aka Conley's point



Sx: Sistrunk Surgery

Fig.3: En-block removal of thyroglossal cyst with duct remnant and central part of hyoid bone via Sistrunk procedure using incision at upper pole of mass.

Thyroglossal fistula

Thyroglossal fistula may be congenital or acquired. Congenital Thyroglossal fistula is a disorder of thyroglossal duct which develops from thyroid primordium in the floor of primitive pharynx at the site of foramen caecum at the junction of posterior one third and anterior two third of tongue.

Acquired- Thyroglossal fistula can develop when the removal of the cyst has not been fully completed. This is usually noticed when bleeding in the neck occurs, causing swelling and fluid ejection around the original wound of removal.

Hood's Sign: The hood sign is a characteristic finding in thyroglossal fistula; where the opening of fistula is indrawn and been overlaid by a fold of skin as hood.

Cystic Hygroma

Cystic hygroma is a fluid-filled sac that results from a blockage in the lymphatic system. It is most commonly located in the neck or head area, but can be located anywhere in the body. It may be discovered in a fetus during a pregnancy ultrasound, or it may be apparent at birth as a soft bulge under the skin.

T/t – Self-resolution, excision or sclerotherapy (Bleomycin)

Branchial cyst/fistula

A branchial cleft cyst is a cyst as a swelling in the upper part of neck anterior to sternocleidomastoid. It can, but does not necessarily, have an opening to the skin surface, called a fistula. The cause is usually a developmental abnormality arising in the early prenatal

period, typically failure of obliteration of the second, third, and fourth branchial cleft, i.e. failure of fusion of the second branchial arches and epicardial ridge in lower part of the neck.

Presents in 3rd decade of life.
Sx: Complete excision

Fistula presents in lower neck, however. The internal opening of this fistula is in the tonsillar fossa

Ix: Fistulogram
Sx: Complete remove